# About the Flaky Structure of Atomic Nucleus. Further Development of Analysis

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**Abstract.** The Neutron-optical model is some remarkable microscope for the investigation of gross-structural elements of atomic nuclei. In paper [1] the detail structure of potential of the neutron interaction with $^{208}$Pb nuclei (for 0.1 Mev < $E_n$ < 15 MeV) was presented. The experimental cross sections $\sigma_{tot}$ from [2] in comparison with the results of calculation are presented. The real part of potential (peripheral area) was $-V_r = 0.38/r^8+0.05/r^4+0.02/r$ (Mev). We may especially underline the role of quantity $C/r^8$ in description of spectrum of scattered neurons with $E_n > 5\div6$ MeV.

There exist another experimental data about $\sigma_{tot}$ for interaction of neutron with $^{208}$Pb in more wide energetic diapason. In work [3] the cross sections for En < 1MeV was measured. We have used these data in our estimation of $\sigma_{tot}$ for $^{208}$Pb. The results are presented at Fig 1. Cross section has a rise at $E_n \leq 0.1$ MeV.

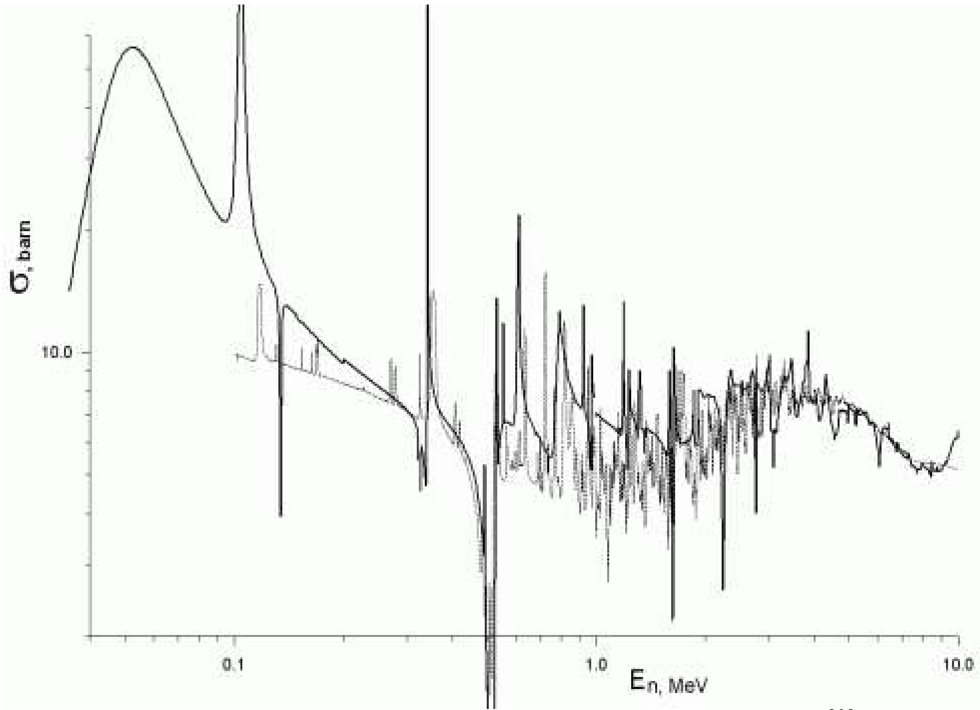


Fig. 1. The calculation of total cross section for interaction of neutron with $^{208}$Pb (solid curve) in comparing with experimental data of the work [2] (dotted curve).

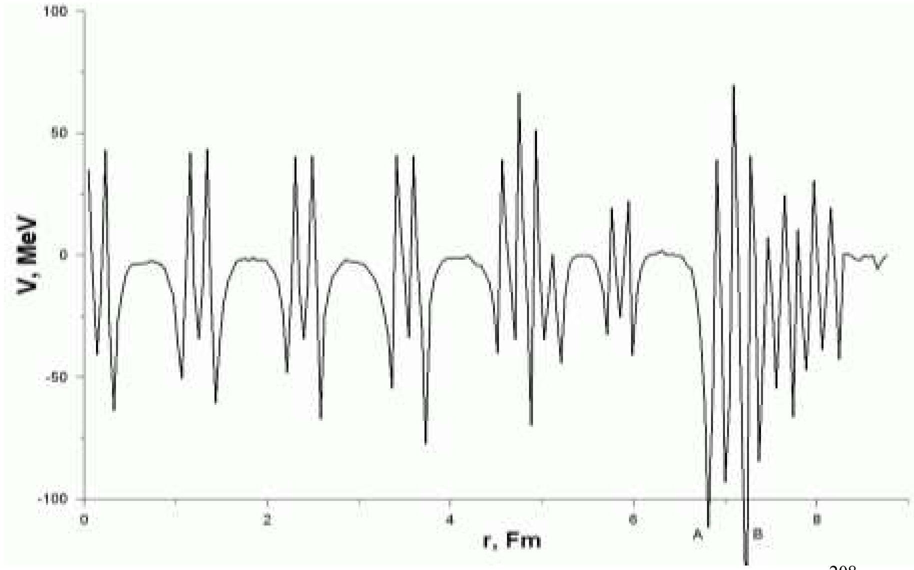

Fig. 2. The real part of calculated optical neutron potential for $^{208}$Pb.

The real part of potential is presented in Fig.2. This part is very close to that published in [1]. The receiving of spin-orbital and imaginary component of potential is described in paper [1].

In this paper we start the description of neutron scattering by stannum nuclei. In IPPE (Obninsk) some interesting measurement of $\sigma_{tot}$ for 12 isotopes of Sn was performed. Every isotope has the mass difference of one neutron from neighbour isotope [4].

We have searched the potential parameters for $^{120}$Sn. The starting set of parameters was fitted early for Pb. The results for real part of potential is presented in Fig.3. Some elements of this potential are very close to that of $^{208}$Pb. The more significant difference is found in peripheral part of nucleus (4 fm < r < 8 fm).

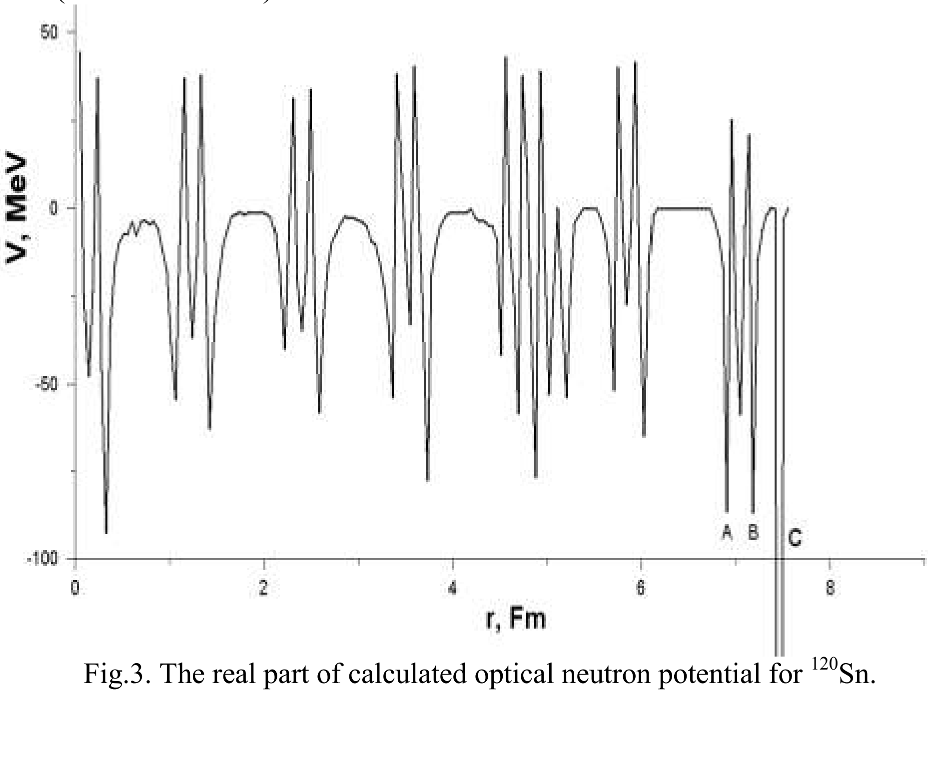

Fig.3. The real part of calculated optical neutron potential for $^{120}$Sn.

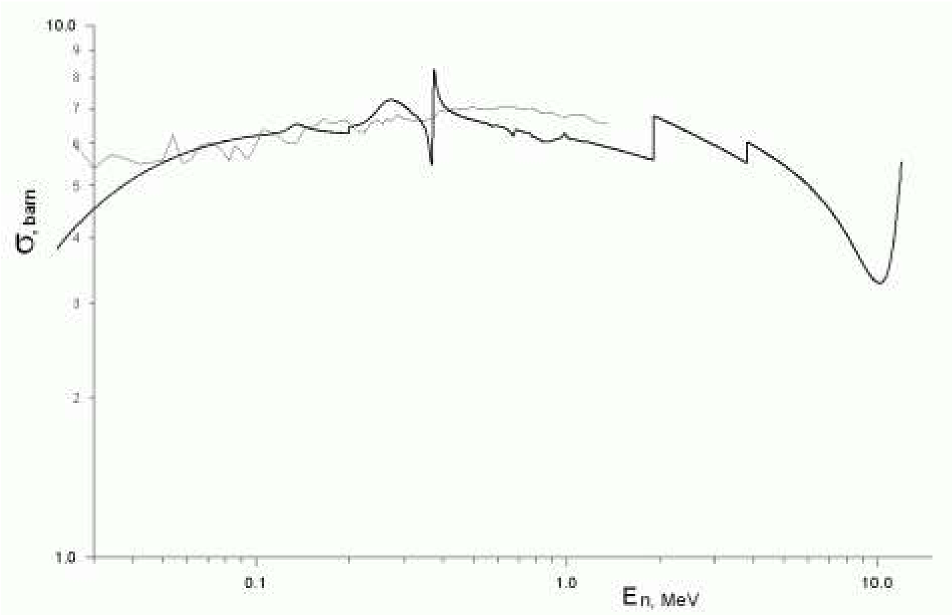


Fig.4. The calculation of total cross section for interaction of neutron with $^{120}Sn$ (solid curve) in comparing with experimental data of the work [4] (dotted curve).

It is interesting to note that maximums A and B (Figs. 2 and 3) have the same positions for Pb and Sn. But for Sn fitting procedure found a great extremum at radius r ≈ 7.5 (point C at Fig.3). At these radius neutron forms orbit with greatest probability.

Outside the central part, given discretely, all components of the potential for $^{120}Sn$ are represented by smooth curves:

$$-V_r = 0.38/r^8 + 0.04/r^4 + 0.03/r,$$

$$V_{so} = 0.0012/r^3,$$

$$-V_{im} = 0.2/r^2$$

All ordinate the internal and external parts of the potential are multiplied by energy dependency coefficients:

EDr – coefficient for the real part.
EDim – for the imaginary part,
EDso – for the spin-orbital part of potential.
EDr = 1.15
EDso = $1/\sqrt{E_n}+2.62E_n$
EDim = 0.00023,
where $E_n$ – energy of scattering neutron, integration step - 0.0464 Fm.

## References


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